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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/083,600	02/27/2002	Timothy J. Davis	Davis 083	1395 <sup>2</sup>

7590 06/11/2003

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EXAMINER

SIMKOVIC, VIKTOR

ART UNIT PAPER NUMBER

2812

DATE MAILED: 06/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/083,600

Applicant(s)

DAVIS ET AL.

Examiner

Viktor Simkovic

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 27 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) 11-13 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-10 is/are allowed.
- 6) ☒ Claim(s) 14-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 14-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motamedi. Motamedi teaches a process for fabricating a MEMS device comprising the steps of:

producing a pattern on the top of the device;

etching said pattern to form a top trench in the substrate with a depths of less than 20% of the substrate thickness;

producing another pattern on the bottom of the substrate;

etching the pattern on the bottom of the substrate to form a trench in the bottom of the substrate with a depth which is less than the thickness of the substrate minus the depth of the top trench;

further etching the top trench to cause the bottom trench to intersect with the top trench.

See Figs. 2A – 2F. While Motamedi does not teach forming the top trench first, it would have been obvious to one of ordinary skill in the art at the time of the invention to do, as this would not affect the process or the device obtained thereby. In general, the transposition of steps, where the steps are substantially identical or equivalent in terms

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of function, manner, and result, was held not to patentably distinguish the processes.

*Ex parte Rubin* 128 USPQ 440 (PTO BdPatApp 1959).

With regard to claim 15, the use of reactive ion etching is well known in the art and official notice is taken. With regard to claim 16, Motamedi teaches a silicon substrate.

With regard to claim 17, while Motamedi does not specify an etching depth, using a 1mm thick substrate would imply depths within the 20-50 micron range claimed. Further, it would be obvious to optimize such etching thicknesses. With regard to claim 18, this claim is broader than claim 14 and all the limitations were addressed above with regard to claim 14. With regard to claim 19, Motamedi also teaches etching to cause at least one pair of adjacent trenches to overlap and thereby release the structure between them and to cause the bottom of at least one trench to intersect with the trench previously formed by etching from the bottom surface.

Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Motamedi as applied to claim 14 above, and further in view of Otani et al. While Motamedi fails to teach the method of depositing a protective layer prior to the second etch, such a step is taught by Otani et al. for a similar process (Fig. 5A – 5E). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide such a protective layer prior to etching the second trenches, as this would temporarily protect the surfaces from the etchant. With regard to claims 21-23, the use of oxides as protective layer, the use of RIE for etching trenches, and the inclusion of a metallic layer for the formation of electrodes are all well known processes and official notice is hereby taken.

***Allowable Subject Matter***

Claims 1-10 are allowed.

The following is a statement of reasons for the indication of allowable subject matter: Prior art of record fails to teach the method of etching the top side of a wafer to form trenches, then etching the bottom side to form trenches aligned with the top trenches, then etching from the top again to connect the trenches, and then continuing to laterally underetch some structures to release them, all in the process of forming a MEMS device.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Viktor Simkovic whose telephone number is 703-308-6170. The examiner can normally be reached on Mon - Fri, 9:00 - 6:00, except every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 703-308-3325. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1782.

A stylized, handwritten signature in black ink, consisting of several overlapping loops and a long horizontal stroke.

Viktor Simkovic  
June 5, 2003

A handwritten signature in black ink, featuring a large, prominent 'J' followed by several loops and a long horizontal stroke.

John F. Niebling  
Supervisory Patent Examiner  
Technology Center 2800